



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 09/895,478  | 06/29/2001  | James Hamden         | 020964-000210US     | 6536             |
| 20350   | 7590        | 04/20/2004           | EXAMINER            |                  |
| TOWNSEND AND TOWNSEND AND CREW, LLP<br>TWO EMBARCADERO CENTER<br>EIGHTH FLOOR<br>SAN FRANCISCO, CA 94111-3834 |             |                      | DOLAN, JENNIFER M   |                  |
|   |             |                      | ART UNIT            | PAPER NUMBER     |
|   |             |                      | 2813                |                  |

DATE MAILED: 04/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/895,478

Applicant(s)

HARN DEN ET AL.

Examiner

Jennifer M. Dolan

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 8-12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Response to Amendment***

1. The Declaration filed on 2/6/04 under 37 CFR 1.131 has been considered but is ineffective to overcome the Hirusuta (U.S. 6,111,312) reference.
2. The evidence submitted is insufficient to establish diligence from a date prior to the date of reduction to practice of the Hirusuta reference to either a constructive reduction to practice or an actual reduction to practice. The lab notes contained in the declaration along with the statement from the inventor establish a conception of the invention prior to June 2, 1999. There is, however, no accounting for the timespan between the date of conception of June 2, 1999 and the filing of the provisional application on May 15, 2001.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
4. Claims 1, 3, 4, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent No. 59-161851 to Yoshida in view of U.S. Patent No. 6,242,800 to Munos.

Regarding claim 1, Yoshida discloses a small footprint device package comprising: a plastic package body (4) for enclosing a die (2, 3'), the package including a top, bottom, and sides (see figures 1-5); a first lead (right side lead 5; figure 5) in electrical and thermal

Art Unit: 2813

communication with the die (see figure 5), and a second lead (5 on the left side) wirebonded to the die (see figure 5), the first and second leads including an enclosed portion and an exposed portion extending from the side of the package and folding underneath the package bottom to form a first lead foot, wherein the angle between the lead on the side of the package and the lead foot is less than 90 degrees (see figure 5), the lead foot being inclined at an angle relative to a planar PC board (8; see figure 5).

Yoshida does not specifically disclose that the portion of the set of first leads extending under the die comprise a diepad.

Munos discloses a semiconductor device package in which a first lead (1) is integral with a first side of the diepad (40; see figures 3 and 4) and in electrical and thermal communication with the die(10) through the diepad.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the leadframe of Yoshida, such that the portions of the first lead formed under the die comprise a diepad, as taught by Munos. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a diepad underneath the die, because Munos shows that providing a diepad with the first leads integral with the diepad helps remove heat from the die, such that the device performance is improved (see Munos, column 2, lines 1-5, 55-67; column 3, lines 12-40).

Regarding claims 3 and 4, Yoshida discloses that the first lead foot forms a reverse gull wing shape (figure 5), and that the package has a reduced profile (figure 5).

Regarding claim 6, Yoshida discloses that the package body further comprises a notch (6b) configured to receive a portion of the first lead foot (figure 5).

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida in view of Munos et al. as applied to claim 1 above, and further in view of U.S. Patent No. 6,114,759 to Okuaki.

Yoshida discloses a package wherein the lead foot is inclined at a small angle relative to the planar PC board (figure 5), but fails to specify the angle or provide a motivation for inclining the lead foot.

Okuaki discloses a small angle inclination of the lead foot relative to the planar PC board (figures 3 and 5) in order to promote solder wetting and maintain a high bond strength (column 3, lines 12-21). The angle is considered to be about 1-7 degrees (see figures 3 and 5), but Okuaki is silent as to the exact angle.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify in Yoshida as modified by Munos an angle of inclination between the lead foot and the PC board of 1 – 7 degrees. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to incline the lead foot at an angle between 1 and 7 degrees relative to the PC board, because slightly bending the free end of an outer lead away from the PC board promotes solder wetting (Okuaki, column 3, lines 12-21), but bending the free end at a large angle decreases the contact area between the leads and the PC board, which can decrease the bond strength and cause an increase in the total package height. It is well within the purview of a person having ordinary skill in the art to select an angle between 1 and 7 degrees to optimize the solder wetting, bond strength, and package height. Although Okuaki fails to specify the exact angle of inclination of the lead foot, it has been held that “where

Art Unit: 2813

the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

6. Claims 1-4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,616,953 to King et al. in view of Munos et al.

Regarding claims 1 and 2, King discloses a small footprint package, comprising: a plastic package body (16) having a top, bottom, and sides (figure 4); a diepad (20) supporting the die (chip 18/180), and first and second leads (figures 2 and 3), the leads in electrical communication with the die through bondwires (figures 4, 5), the leads including an enclosed portion and an exposed portion folding back along the side of the package (figure 5, ‘at’ 320b) toward the bottom, and folding underneath the package to form a lead foot (end portion angling up toward the package bottom; see figure 5), wherein the angle between the lead foot and the side portion is less than 90 degrees (figure 5; the angle appears to be about 45 degrees), and the lead foot being angled relative to an underlying PC board (figures 1 and 5; it is implicit that the package is to be connected to a wiring board, such that the package can be soldered to an underlying element; see column 4, lines 1-30).

King fails to specify that the first leads are integral with the diepad.

Munos discloses a semiconductor device package in which a first lead (1) is integral with a first side of the diepad (40; see figures 3 and 4) and in electrical and thermal communication with the die (10) through the diepad.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the leadframe of King, such that the first lead is formed integral with the diepad, as taught by Munos. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide the first lead integral with the diepad, because Munos shows that providing leads integral with the diepad helps remove heat from the die, such that the device performance is improved (see Munos, column 2, lines 1-5, 55-67; column 3, lines 12-40).

Regarding claims 3 and 4, King discloses that the lead forms a reverse gull wing shape, and that the package has a reduced profile (see figure 5).

Regarding claims 6 and 7, King discloses that the package body includes a notch to receive part of the lead foot; and that the notch is about two-thirds the thickness of the lead (see figure 5).

7. Claims 1-4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,111,312 to Hirimuta et al. in view of Munos et al.

Regarding claim 1, Hirimuta discloses a small footprint semiconductor device package comprising: a plastic package body (13) for enclosing a die (12), the plastic package body including a top coupled to a bottom through a plurality of sides (figure 4); a diepad (17) supporting the die, the diepad having a first side and a second side opposite to the first side (figure 4); first and second leads (14) nonintegral with the diepad and in electrical communication with the die through a bondwire (figure 4), the leads including an enclosed portion (15) by the package body and in electrical communication with the die (figure 4), and an

Art Unit: 2813

exposed portion of the leads (16) extending from the side of the package body, folding back along the side of the package toward the bottom of the package at a first angle (substantially vertical portion; figure 4), and folding underneath the package bottom toward a center of the bottom of the package to form a first and second lead foot (figure 4), whereupon the portion of the lead along the side of the package and the portion of the lead along the bottom of the package form an angle of less than 90 degrees from each other (figure 4; side portion is substantially vertical, and foot portion is inclined upwards from a horizontal line); and the first and second lead foot being inclined at a second angle (figure 4) relative to an underlying planar PC board (22, column 2, lines 26-32) to promote solder wetting (inherent, due to the shape and inclination of the lead foot).

Hirumuta fails to disclose that the first lead is integral with a first side of the diepad and in electrical and thermal communication with the die through the diepad.

Munos discloses a semiconductor device package in which a first lead (1) is integral with a first side of the diepad (40; see figures 3 and 4) and in electrical and thermal communication with the die(10) through the diepad.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the leadframe of Hirumuta, such that the first lead is formed integral with the diepad, as taught by Munos. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide the first lead integral with the diepad, because Munos shows that providing leads integral with the diepad helps remove heat from the die, such that the device performance is improved (see Munos, column 2, lines 1-5, 55-67; column 3, lines 12-40).



Art Unit: 2813

Regarding claim 2, Hirimuta discloses that the die is a flash memory chip (column 4, lines 16-20).

Regarding claim 3, Hirimuta discloses a reverse gull wing shape (figure 4).

Regarding claim 4, Hirimuta discloses that the package has a reduced package profile including the leads (figure 4; column 2, lines 19-23; column 6, lines 56-64).

Regarding claim 6, Hirimuta discloses that the package body further comprises a notch (24) configured to receive a portion of the first and second lead foot (16a; figure 4), thereby permitting the first and second lead foot to be partially recessed within the package body (figure 4) in order to reduce a height of the package.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirimuta et al. in view of Munos et al. as applied to claim 1 above, and further in view of Okuaki.

Hirimuta discloses a package wherein the lead foot is inclined at a small angle relative to the planar PC board (figures 4 and 6), but fails to specify the angle or provide a motivation for inclining the lead foot.

Okuaki discloses a small angle inclination of the lead foot relative to the planar PC board (figures 3 and 5) in order to promote solder wetting and maintain a high bond strength (column 3, lines 12-21). The angle is considered to be about 1-7 degrees (see figures 3 and 5), but Okuaki is silent as to the exact angle.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify in Hirimuta as modified by Munos an angle of inclination between the lead foot and the PC board of 1 – 7 degrees. The rationale is as follows: One of ordinary skill in the

Art Unit: 2813

art at the time the invention was made would have been motivated to incline the lead foot at an angle between 1 and 7 degrees relative to the PC board, because slightly bending the free end of an outer lead away from the PC board promotes solder wetting (Okuaki, column 3, lines 12-21), but bending the free end at a large angle decreases the contact area between the leads and the PC board, which can decrease the bond strength and cause an increase in the total package height. It is well within the purview of a person having ordinary skill in the art to select an angle between 1 and 7 degrees to optimize the solder wetting, bond strength, and package height. Although Okuaki fails to specify the exact angle of inclination of the lead foot, it has been held that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirimuta et al. in view of Munos et al. as applied to claim 6 above, and further in view of U.S. Patent No. 6,433,418 to Fujisawa et al.

Hirimuta fails to disclose that the notch includes a depth of about two thirds of the thickness of the lead.

Fujisawa discloses a notch (28a) that includes a depth of about two-thirds of the thickness of the lead (figures 8 and 9). Fujisawa is, however, silent as to the exact depth of the notch.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the notch of Hirimuta as modified by Munos, so that the depth is about two-thirds of the thickness of the lead, as suggested by Fujisawa. The rationale is as follows:

Art Unit: 2813

One of ordinary skill in the art at the time the invention was made would have been motivated to provide a notch with a depth as specified, so that the device can be easily stacked, yet maintain a small profile (Fujisawa, figures 12 and 13). Additionally, a notch of a depth as specified, and as in figures 12 and 13 of Fujisawa, provides the advantages of preventing damage to the leads during assembly or mounting, in the form of short circuiting or deformation (Fujisawa, column 8, line 64 – column 9, line 17), while preventing the lead from retracting entirely into the protective notch during assembly. Although Fujisawa fails to specify the exact angle of inclination of the lead foot, it has been held that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

### ***Response to Arguments***

10. Applicant's arguments filed 2/6/04 have been fully considered, but are moot in view of the treatment of the declaration under C.F.R. 1.131, supra, as well as in view of the new grounds of rejection.

### ***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 4,794,446 to Hamano, U.S. Patent No. 4,722,470 to Johary, and JP 61-207041 to Tanaka disclose packages having leads folded back underneath the device at angles of less than 90 degrees.

Art Unit: 2813


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan  
Examiner  
Art Unit 2813

jmd

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800